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INFORMATION SIGNAL TRANSMISSION DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information signal transmission device such as video devices constituting an audio video system. More particularly, the present invention relates to the information signal transmission device that transmits and receives a message with no particular discrimination between outside and inside the device and with no particular discrimination between specified destinations and unspecified destinations, if viewed from an object within the device, by organizing information broadcasting means for broadcasting a message to a network and an event manager responsible for delivery of the message in a device, so that the network is released for the transmission of information signal as long as possible.

2. Description of the Related Art

In a conventional audio video (AV) system for transmitting information signal such as a video signal and audio signal, a video signal and an audio signal output by a tuner or a video cassette recorder are input to a television receiver through a dedicated analog line, and the television receiver is controlled through a remote

To respond to the change in the state of each network terminal, the core device in the system regularly

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In the one-to-one communication in which a destination of a message is ^{req'd} ~~specified~~, an acknowledgement is made, and a retransmission is requested in the event of a timeout to perform this type of interrogation. With this arrangement, however, the change of the lineup of the connected devices requires the ^{one} ~~sender~~ to receive an acknowledgement from each of the destinations of a variable number for successful reception, making complex a

SUMMARY OF THE INVENTION

To achieve the above object, the present invention comprises information broadcasting means for broadcasting a message to the network and an event manager responsible for delivering the message within the device.

With the information broadcasting means for broadcasting the message to the devices connected to the network and the event manager responsible for delivering the message within the device, the object in the device can exchange a message with an unspecified destination without any discrimination between outside and inside the device by simply exchanging a message with the event

manager in a one-to-one communication. With this arrangement, the workload on the object is lessened, a coordinated operation between objects and between devices is assured, and a sufficient time is thus allowed for the transfer of the information signal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing an audio video (AV) system of one embodiment of the present invention;

FIG. 2 shows a message transmitted by each object;

FIGS. 3(A) and 3(B) show a service list of a broadcast client of FIG. 1;

FIGS. 4A and 4B show a message which is reported to a broadcast manager by an event manager of the broadcast client of FIG. 1;

FIGS. 5A through 5C show a message which is related to the registration of the service list;

FIGS. 6A and 6B are diagrams explaining a packet transmitted from a network messenger to a transmission module;

FIG. 7 is a diagram explaining a packet transmitted from a broadcast messenger to a transmission module;

FIG. 8 shows a table that records a client ID held by the broadcast manager;

FIG. 9 is a diagram explaining a backlog held by the

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FIG. 20 is a continuation of the flow diagram of FIG.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the embodiment of the present invention is now discussed.

FIG. 1 is a functional block diagram of communication system of an audio video (AV) system according to one embodiment of the present invention. The AV system 1 is organized by connecting a television receiver 2 and a video cassette recorder 3 through a network 4, and the television receiver 2 is set as a core device for the system for controlling the general operation of the system.

Although the television receiver 2 and video cassette recorder 3 have different objects to be controlled and different control procedures associated with the different objects, they share the common communication system. In the following discussion, identical components are designated with the same alphanumeric letters and the explanation about them is not duplicated.

The video cassette recorder 3 receives on a desired channel in its unshown tuner and outputs a video signal and an audio signal. The video cassette recorder 3 further records, in its magnetic recording and reproducing unit, the video signal and audio signal received in its

tuner or received through the television receiver 2, and reproduces the recorded video and audio signals. The video cassette recorder 3 includes objects 3A and 3B, each constructed of a control module for controlling the tuner and the magnetic recording and reproducing unit, and each assigned a unique identification (ID) number.

The television receiver 2 receives on a desired channel and outputs the video signal and audio signal. The television receiver 2 further displays on its monitor the video signal output by the tuner, or displays the video signal reproduced by the video cassette recorder 3. The television receiver 2 includes objects 2A and 2B, each constructed of a control module for controlling the tuner and the monitor, and each assigned a unique ID number.

When an event which needs to be reported to many and unspecified destinations takes place, the objects 2A through 3B report the event to other modules within the respective device via the event manager 2D, 3D as a broadcast client, or report the event to external devices via the event manager 2D, 3D as a broadcast client, broadcast manager 2F, 3F and the network 4. The term event means a change in the state of a module to be controlled by the objects 2A through 3B; for example, the events in the video cassette recorder 3 includes a channel switching action by a user, and the end of the loading,

03040506070809101112131415161718192021222324252627282930313233343536373839404142434445464748495051525354555657585960616263646566676869707172737475767778798081828384858687888990919293949596979899100

The objects 2A through 3B report the occurrence of the event to the modules within the devices by exchanging a message with the modules within the devices through the event managers. When the event managers report the event, they request the broadcast manager 2F, 3F to broadcast the message.

In the exchange of messages, the objects 2A through 3B report a message to the broadcast client 2D, 3D via local messenger 2C, 3C. The broadcast client 2D, 3D thus delivers the message to registered destinations within the device and unspecified destinations outside the device. Conversely, the device receives the message delivered by

the broadcast client 2D, 3D, through the local messenger 2C, 3C; in this way the message transmitted from within the device or from the external devices connected to the network 4 is acquired. The delivery of the message to the destination registered in the device is handled through the function of the event manager in the broadcast client 2D, 3D and the delivery of the message to the unspecified destinations outside the device is handled by the event manager, as the broadcast client 2D, 3D, which uses the broadcast manager. The broadcast message received through the network is delivered to a registered destination by the event manager in one-to-one communication.

The objects 2A through 3B report a variety of messages to within and outside the device in a one-to-one communication with the broadcast client 2D, 3D. Regardless of destinations outside or within the device, an ordinary communication with a single destination is processed by the local messenger. With a destination being a particular device outside the device, the local messenger performs communication using a network messenger.

Referring to FIG. 2, the message transmitted from the objects 2A-3B to the broadcast client 2D, 3D is constructed of a header identifying a destination and an originator and a message section containing the content of

The local messenger 2C, 3C manages the transmission and reception of a message which has a destination that is identified as one of the modules within the device. More particularly, each of the local messenger 2C, 3C reports the message to the destination corresponding to the destination ID set in the header referring to the ID set in each module. When the corresponding module is currently working, the local messenger 2C, 3C holds the message so that the request to the module may not be lost. The local messenger 2C, 3C provides each message to the corresponding module by storing once each message in a memory to manage the organization of the addresses corresponding to the destinations in the memory, or by forming a link between addresses according to a series of message destinations to manage the list of links. When a destination ID is not the one within the device, the local messenger 2C, 3C requests the network messenger 2E, 3E to

process it.

The broadcast client 2D, 3D includes an event manager and a service registry. The event manager delivers an event message input via each of the local messenger 2C, 3C to the module within the device, while using the broadcast manager. The service list is a list of objects (objects of communication within and outside the device, viewed from the event manager, and including the network messenger 2E, 3E), and is updated by a predetermined message reported via the local messenger 2C, 3C. The service registry is a list of the modules within the device, and is used by the broadcast manager during service search.

The event manager delivers the message (event information) that is acquired from the local messenger 2C, 3C according to the service list. More specifically, the event manager produces two messages for objects 1 and 2

When the event manager sends the message to the

broadcast manager 2F, 3F, it also sends the content of the message (shown in FIG. 4A) reported by the local messenger 2C, 3C. With this arrangement, the event manager receives the report of the message from the broadcast manager 2F, 3F in the same format as the message report from the objects 2A-3B as shown in FIG. 4A.

To deliver the message, the event manager recognizes the message type of the message received. Furthermore, when the event manager determines, according to the message type, that the received message is an observe message, the event manager updates the service list based on the content of the message. The video cassette recorder 3, for example, updates the service list when a new device is connected to the network 4 so that the video cassette recorder 3 reports a variety of events to the newly connected device.

FIG. 5 shows the message that is used to report the observe message. The message section only is shown in FIG. 5. The observe message is produced, as necessary, by an object within or outside the device. When the connection of a device to the network 4 is physically detected, for example, the observe message is reported to the event manager from the newly connected device or the device already connected to the network via the network messenger 2E, 3E or the broadcast manager 2F, 3F.

A series of messages are formed with parameters expanded, compared with the messages exchanged between modules through the local messenger 2C, 3C (see FIGS. 2A and 4A). More particularly, the message requesting the registration of an observer to the service list (FIG. 5A) is assigned 32-bit data in the message type indicative of the observe type, and the event number to be reported and the observer indicative of the destination are set in the parameter. The message (FIG. 5B) requesting the cancellation of the registration is assigned data indicative of cancellation in the message type, and the event number requesting cancellation and the observer indicative of the destination to be canceled are set in the parameter.

32-bit data. In succession, a packet type representing the type of the packet is described by 16-bit data. The packet type discriminates a transmission packet sent to a particular destination, a response packet that is transmitted to a particular destination which issues a request in response to a request from an external device, and a broadcast packet that is broadcast to each device connected to the network. In case of the broadcasting, the broadcast packet to be fed to the transmission module 2G, 3G is created by the broadcast manager 2F, 3F rather than by the network messenger 2E, 3E.

The header is tagged with a message ID that discriminates between a transmission packet and a response packet. Furthermore, the header has an ID for identification in the destination node which is described by 32-bit data. The destination ID helps a destination device identify which object of the device the response is issued to.

The network messenger 2E, 3E receives the packet input to the transmission module 2G, 3G, selects the packet that is addressed to own device as a destination node, and sends the message of the packet to the local messenger 2C, 3C. The network messenger 2E, 3E outputs the message of the object within the device to the external device via the local messenger 2C, 3C and

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conversely reports the message coming in from the external device to the object within the device via the local messenger 2C, 3C.

The network messenger 2E, 3E updates the stored list of the external devices according to the received message as the broadcast client 2D, 3D does. With this arrangement, the video cassette recorder 3 is enabled to exchange a variety of messages with a newly connected device in the one-to-one communication.

Conversely, the broadcast manager 2F, 3F receives, via the transmission modules, the message that is broadcast to the network by another device and further the message related to the broadcasting, and reports them to

the broadcast client 2D, 3D.

FIG. 7 shows the message the broadcast manager 2F, 3F sends to the transmission module 2G, 3G. The broadcast manager 2F, 3F sets the message, already described with reference to FIG. 4, from the broadcast client 2D, 3D in a body, and adds data about a sender node, a broadcast ID and a client ID to the body.

The sender node identifies own device. The broadcast ID is assigned a serial number set by the broadcast manager 2F, 3F. The broadcast manager 2F, 3F sequentially increments the broadcast ID each time one message is transmitted to the network. The broadcast manager 2F, 3F at the destination node recognizes the change in the broadcast ID, thereby detecting a missing message or a reception failure.

If the destination detects a missing message, it may request a retransmission of the message. In the retransmission of the message, a retransmission request can be accepted in the one-to-one communication with the destination specified, and the message can be retransmitted in response to the retransmission request in the one-to-one communication. In this way a sufficient reliability will be assured even if a desired message is broadcast without an acknowledgement from a broadcast receiver (namely, without performing a timeout process).

The broadcast manager 2F, 3F stores a table shown in FIG. 8 to process the message from the destination of broadcast referring to the client ID as a reference, and reports the message to an internal module corresponding to the client ID, according to the table. More particularly, in this table, an ID within the device designating the broadcast manager 2F, 3F is set to be the client ID added to a pulse packet to be described later. An ID within the device designating the event manager is registered in the message that reports the event. An ID within the device representing the service registry holding the list of service modules within the device is registered in the message related to the search of services.

When the broadcast manager 2F, 3F acquires the message via the transmission module 2G, 3G, the broadcast manager 2F, 3F acquires it according to the format specified in FIG. 7, and organizes the header according to the table shown in FIG. 8 to report it to the broadcast

client 2D, 3D.

When the message is sent in this way, the broadcast manager 2F, 3F stores a backlog of transmission records for each network for a predetermined period of time, and retransmits the previously broadcast message in the one-to-one communication in accordance with the request from other devices. The broadcast manager 2F, 3F thus retransmits the message to the devices that have missed the message.

As shown in FIG. 9, the broadcast manager 2F, 3F records sequentially the time of broadcasting the message, the broadcast ID of the broadcast message, the client ID and the body, thereby forming a backlog. The broadcast manager 2F, 3F may receive no message of retransmission from other devices within a predetermined time elapse from the time of broadcasting, after the broadcast manager 2F, 3F records the backlog. In such a case, the broadcast manager 2F, 3F deletes the recorded items from the backlog. The predetermined time is a duration long enough for the receiver side to detect a reception failure, and will be set as described later.

The broadcast manager 2F, 3F periodically transmits the pulse packet having the organization shown in FIG. 10. The pulse packet is constructed of the destination node, the broadcast ID, and the client ID. This organization is

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The broadcast manager 2F, 3F in each of the devices connected to the network 4 compares the broadcast ID assigned to the pulse packet to the broadcast ID of the message received immediately before it to detect a reception failure. When a reception failure is detected, the destination of the message is identified based on the client ID of the pulse packet so that the retransmission request is placed in the one-to-one communication.

The broadcast manager 2F, 3F holds the broadcast message in the backlog for a duration at least twice as long as but shorter than several ten times the transmission repetition period of the pulse packet, before deleting the message. Since there is a possibility that a receiver may fail to receive a packet for the second time in succession to a first reception failure, the duration of time for holding the message is set in consideration of the reliability of the network 4. The broadcast manager 2F, 3F reliably retransmits the message in response to the retransmission request the receiver issues after detecting

In the television receiver 2 and video cassette recorder 3, a variety of transmission module 2G, 3G may be added to each of the network messenger 2E, 3E. For example, besides the TCP/IP interface, the IEEE 1394 interface may be included to connect external devices. Through the one-to-one communication carried out by the network messenger 2E, 3E, a user may input a record channel and record time by operating the video cassette recorder 3, and then may visually check the record channel and the record time watching the display screen of the television receiver 2.

Upon sending the message in one packet, the transmission module 2G, 3G releases the network 4 for another job (a transfer of the video data and audio data, for example) without waiting for a response message. The transmission module 2G, 3G monitors the network 4. When a packet addressed to own device as a destination node is transmitted to the network, the transmission module 2G, 3G receives it, and reports the packet to the broadcast manager 2F, 3F or the network messenger 2E, 3E.

FIG. 12 is a flow diagram showing the processing by the event manager. The event manager performs this processing when an observe message (FIG. 5A) requesting a

When the corresponding event number is unregistered in the service list with an affirmative answer resulting from step SP3, the event manager goes to step SP6 to register the event number in the service list. The event manager then goes to step SP4 to register a destination. In this way, the event manager sets the destination of the message as required, and the event manager also exchanges a variety of messages between modules within the device in the one-to-one communication.

FIG. 13 is a flow diagram showing the process by the event manager when a message to cancel the registration (FIG. 5B) in the service list is reported. The event manager goes to step SP11 from step SP10 to receive the message, and then goes to step SP12. The event manager searches the service list for the corresponding event

In succession, the event manager goes to step SP13 to determine whether the destination list of the event number is empty. When any destination registered remains in the destination list, the event manager goes to step SP13 to end the process. When no destination remains in the destination list with an affirmative answer resulting from step SP13, the event manager goes to step SP15 where the event manager deletes the event number from the service list. The event manager goes to step SP14.

When a predetermined object is removed, the event manager deletes all destinations related to the message to cancel all registrations so that unnecessary process is reduced.

FIG. 14 is a flow diagram showing the process by the event manager when the message of an event occurrence to be broadcast is reported. The event manager goes to step SP21 from step SP20 to receive the message. The event manager goes to step SP22 to request the broadcast manager 2F, 3F to broadcast the event. The event manager then goes to step SP23 to determine whether the corresponding event number is registered.

When the corresponding event number is unregistered, the event manager goes to step SP24 and ends the process

The message of the event occurrence thus delivered by the event manager is organized by assigning data indicative of the report type to the message type as shown in FIG. 15.

When the message broadcast to the network 4 is reported by the broadcast manager 2F, 3F, the event manager performs a predetermined process to deliver the message shown in FIG. 16 to the corresponding module. The message here is organized by assigning data of broadcast type indicative of broadcast to the message type.

FIG. 17 is a flow diagram of the process by the event manager when the message broadcast to the network 4 is reported by the broadcast manager 2F, 3F. The event manager goes to step SP31 from step SP30 to receive the event, and then goes to step SP32. The event manager determines whether the corresponding event number is registered in the service list.

FIG. 18 is a flow diagram of the process by the broadcast manager 2F, 3F when an event is broadcast. The broadcast manager 2F, 3F goes to step SP41 from step SP40 to receive the message when the message described with reference to FIG. 4 is reported. In succession, the broadcast manager 2F, 3F goes to step SP42 to detect the client ID of the event manager referring to the table describing the client ID already described with reference to FIG. 8.

The broadcast manager 2F, 3F goes to step SP43 to increment the broadcast ID that is most recently broadcast to the network, and then goes to step SP44. The broadcast manager 2F, 3F constructs the body of the client ID detected in step SP42, the broadcast ID produced in step SP43, and the reported message, and thus forms the packet

When the reception record is already held in the table with an affirmative answer resulting from step SP52 (FIG. 19), the broadcast manager 2F, 3F goes to step SP57. The broadcast manager 2F, 3F determines whether the broadcast ID added to the message is greater than the value that is obtained by adding 1 to the broadcast ID in the reception record.

The broadcast manager 2F, 3F goes to step SP59 to wait for the retransmission of the message. Upon

When the answer in step SP62 is affirmative, a

When the answer in step SP62 is negative, the broadcast manager 2F, 3F goes to step SP63 to update the corresponding broadcast ID in the reception record. The broadcast manager 2F, 3F goes to step SP64 to update the reception time, and then goes to step SP54. The broadcast manager 2F, 3F therefore updates the past reception record when it receives the message broadcast by the once registered sender, while delivering the received message to the corresponding module.

The message is reported to the broadcast client 2D, 3D by the local messenger 2C, 3C, respectively, and is then delivered to the broadcast manager 2F, 3F (FIGS. 4A and 4B). The event manager searches the service list

(FIGS. 3(A) and 3(B)) for the corresponding destination. When there is the corresponding destination, the message is delivered to the destination. In the television receiver 2 and video cassette recorder 3, the event is reported to the corresponding module in the one-to-one communication.

A client ID and a broadcast ID are set for the message thus reported to the broadcast manager 2F, 3F according to the list held by the broadcast manager 2F, 3F. The message, the client ID and the broadcast ID are organized into the packet in the predetermined format (FIG. 7) and the packet is reported to the transmission module 2G, 3G. The message in the packet is then broadcast to the network by the transmission module 2G, 3G.

The AV system 1 releases the network 4 for the transfer of the audio data and video data immediately after the message is broadcast. The AV system 1 therefore releases the network 4 for a sufficiently long time for the transfer of the information signal such as the video data and audio data.

The message sent to the network 4 is held along with the transmission time, the broadcast ID, and the client ID in the backlog in the broadcast manager 2F, 3F (FIG. 9), and is thus stored for the predetermined period of time.

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The broadcast manager 2F, 3F to which the message is transmitted produces the pulse packet based on the same broadcast ID (FIG. 10), and the pulse packet is periodically transmitted to the network 4 to which the message is transmitted.

In the other devices connected to the network 4, the transmission module 2G, 3G receives the broadcast packet, and the message of the packet is then reported to the broadcast manager 2F, 3F. The broadcast manager 2F, 3F determines, based on the sender ID, whether there is a past reception record from the same device in connection with the message. When there is no past record, the reception time, sender node, broadcast ID and network type of the message are recorded (FIG. 11). The message is sent to the event manager of the broadcast manager 2F, 3F designated by the client ID, and is then delivered to the object in accordance with the service list. The data, required for the one-to-one communication, identifying the device that transmits the message is added to the list held by the network messenger 2E, 3E.

The object that has received the report detects a device newly installed to the network, and sends the corresponding message in compliance with the needs of other objects. The message is transmitted by the local messenger to the network messenger 2E, 3E. The network

messenger 2E, 3E then transmits the message in the one-to-one communication with the newly installed device as the destination.

The pulse packet that is transmitted periodically in succession to the message broadcasting is also received by other devices connected to the network 4. The broadcast manager 2F, 3F determines, based on the sender ID, whether there is a past reception record from the same device in connection with the pulse packet. When there is no past record, the packet is added to the reception record. To detect a past message reception failure, the broadcast manager 2F, 3F determines whether the broadcast ID of the packet coincides with the broadcast ID in the reception record plus 1. The broadcast manager 2F, 3F also determines, based on the client ID, whether the message is a pulse packet.

When a reception failure is detected, another device organizes a packet to request the retransmission of the message based on the sender node and broadcast ID of the pulse packet, and the packet is transmitted to the network 4 in the one-to-one communication with the broadcast manager of the device that has transmitted the message as the destination.

The device that has originally transmitted the message receives the packet of the retransmission request,

and the retransmission request message is sent to the broadcast manager 2F, 3F. Based on the sender node and the broadcast ID added to the retransmission request, the message previously broadcast and recorded is organized into a packet, and the packet is transmitted in the one-to-one communication to the broadcast manager of the device that has issued the message of retransmission request. In this way, even if the network is immediately released for another job immediately after the transmission of the message, a variety of messages are reliably broadcast.

In such a case as well, the device in which an event occurs causes the event manager to issue the message in the one-to-one communication. The message of the event is further sent to the broadcast manager 2F, 3F, which broadcasts the message to the network. The message of the

event is tagged with the broadcast ID that is the previous broadcast ID plus 1, is then broadcast to the network 4, and is recorded in the backlog.

Like the previous message, this message is received in the other devices connected to the network 4 and sent to the broadcast manager 2F, 3F. The broadcast manager 2F, 3F determines whether there is a past reception record in connection with the message in the same way as the previous pulse packet. The broadcast ID in the message is compared with the one in the past reception record. When the broadcast ID is greater than the broadcast ID in the past reception record by more than 1, there must be a missing message between the reception record and the currently received message. The broadcast manager 2F, 3F produces a packet for a retransmission request, and the packet is transmitted to the network 4.

The reception failure in the message broadcast to the network is detected by the change in the broadcast ID. In response to the detected reception failure, the AV system 1 places a retransmission request. In this way, even if the network is immediately released for another job immediately after the transmission of the message, a variety of messages are reliably broadcast.

The message recorded in the backlog is deleted after a time sufficient enough to detect a reception failure in

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with the event manager, the object in the device can exchange the message with unspecified destinations without regard to the difference between communication within the device and communication between devices. In this way, cooperation between objects within the device and cooperation between devices are assured, reducing the workload imposed on each object. A time sufficient enough to transmit information signal is thus assured.

The exchange of the message with a particular destination is performed by requesting the local messenger. When the destination is outside the device, the local messenger sends the message to the network messenger, and the object can thus exchange the message without regard to the difference between communication within the device and communication between devices. With the local messenger also handling the communication with the event manager, the object can thus report a variety of messages in a simple process.

The message, when broadcast to the network 4, is tagged with the broadcast ID sequentially incremented at each message broadcasting. By storing the message for a predetermined period of time, the reception failure is detected referring to the change of the broadcast ID attached to the message. When the reception failure is detected, the message is retransmitted. Even if the

network is released for another job after the broadcasting of the message, the message is reliably transmitted. A time sufficient enough to transmit the information signal is assured resulting in an improved reliability of the system.

The pulse packet is organized by removing the body from the transmitted message and is periodically transmitted. The receiver side can thus detect a reception failure by comparing the broadcast ID attached to the immediately preceding message to the broadcast ID of the pulse packet. Even if the network is released for another job after the broadcasting of the message, the message is reliably transmitted. A time sufficient enough to transmit the information signal is assured resulting in an improved reliability of the system.

In the above embodiment, the broadcast ID as reference information attached to the message is sequentially incremented. The present invention is not limited to this method. The broadcast ID may be sequentially incremented according to a predetermined rule.

In the above embodiment, the broadcast ID of the pulse packet as verification information is assigned the broadcast ID of the message broadcast immediately before it. The present invention is not limited to this method.

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In the above embodiment, the event manager and the broadcast manager are organized as separate modules. The present invention is not limited to such an organization. Both managers may be integrated into a unitary module. With this arrangement, the communication between the two modules is dispensed with, and the speed of communication is increased. As for the remaining modules, a plurality of modules may be integrated.

In the above embodiment, the destination of the message is modified depending on the type of event by delivering each event according to the service list. The present invention is not limited to this method. The destination of the message may be modified depending on the site of an event occurrence (in the device, in a particular room, in a particular network, for example) besides the type of event. With this arrangement, the broadcast managers share the service list so that the broadcasting by a particular device no objects are interested in are prevented from being retransmitted, and

In the above embodiment, the present invention is applied to the television receiver and the video cassette recorder, both constituting the AV system. Beside such an application, the present invention finds applications in video equipment such as satellite broadcast receivers, audio equipment connected to a network and computers.

According to the present invention, the information broadcasting means for broadcasting the message to the network and the event manager responsible for delivering the message in the device are provided. By simply exchanging the message with the event manager, the object can perform message exchange without any discrimination between communication outside the device and communication inside the device or without any discrimination between particular destinations and unspecified destinations. In this way, cooperation between objects within the device and cooperation between devices are assured, permitting a time sufficient enough to transmit information signal.